

Sludge Handling in the Sooner State

Smaller Oklahoma city upgrades their wastewater treatment plant's sludge handling system using the latest intelligent equipment.

Perry, Oklahoma is located about 60 miles due north of Oklahoma City and serves as the county seat for Noble County. Perry has an estimated population of 5,042 (U.S. Census 2007) and includes about 2,200 households. Perry's wastewater treatment plant has a maximum rating of two mgd and receives an average of 500,000 gpd of wastewater. The plant consists of a manual coarse bar screen, two aeration basins, two clarifiers, and disinfection by chlorination.

Scope

In December 2015, Perry elected to build a new sludge thickening/conditioning basin at the plant, which included installation of a 30-cubic yard sludge dewatering container filter, or sludge box. In addition, a polymer injection system was installed, five existing sludge drying beds were retrofitted, and return activated sludge (RAS) pumps at the existing clarifiers were replaced, with a total project cost of \$350,000.

Sludge was previously moved at the plant by two rail-mounted submersible non-clog pumps that were old, failing, and often clogged due to material bypassing the bar screen at the lift station. However, the primary impetus for their replacement was the new sludge box thickening/conditioning system which consists of a polymer mixing/injection system and a dumpster-like structure to dewater biosolids so that they can be stored and stabilized on the retrofitted sludge drying beds until land applied. The city needed to discharge sludge at two different rates—one rate for sludge returning to the headworks RAS and another rate for sending material to the sludge box. The system is designed to speed up dewatering biosolids as a replacement to the existing sand drying beds.

Perry's consulting engineer, Monsoon Consultants, San Luis Obispo, California, originally recommended two different sized pumps in its design—one pump for return and one pump for waste to accommodate the sludge box requirements.

Local Xylem distributor Automatic Engineering, however, stepped in and suggested Concertor® pumps so that each station would have 100 percent redundancy.



Concertor® pump being removed after 1 month of operation for inspection.



Old pumps with a few rags still hanging on.

Customer: Perry, OK
Challenge: Old, Failing Pumps
Solution: Concertor | SCADA

Solution

Concertor® pumps combine a fully integrated control system with IE4 motor efficiency, N-hydraulics, and intelligent functionalities. The control system automatically adapts to the changing pumping environment, delivering the optimal level of performance at the lowest cost of ownership. Built-in intelligence also makes it easier to set up and operate, as well as allowing for a significantly smaller footprint, including controls.

Meanwhile, the adaptive N-impeller moves axially upward when needed, allowing bulky fibrous material and debris to pass through smoothly. After the debris has passed, the hydraulic pressure returns the impeller to its original position. Not only does this prevent clogging and reduce stress on the shaft, seals, and bearings, it also enables a sustained low usage of energy.

The ability to quickly and easily change flow rates was very appealing to the Perry wastewater treatment plant staff. As for replacement, nothing unusual was encountered in the project: the old pumps were simply pulled out and replaced with the Concertors. Pump controls were added in a new building, which also houses the polymer mixing and injection system.

Results

The new pumps went into service in April and May 2017 and the staff is thrilled that they have experienced no clogging. Perry's flow rates for this application vary based on the head requirements between the clarifiers and range between 85 and 370 gpm, depending on the pump speed. Personnel are anxiously awaiting commencement of a SCADA project, which is expected to dramatically smooth varying the pump flow rate, speed, and power settings.

When asked about the performance of the new Concertor pumps, the design engineer, Blaine Reely with Monsoon Consultants, stated that "the new Concertor pumps have been operating flawlessly and have given our operator the flexibility to perfectly match our RAS flows, either in the return mode or the wasting mode, with the ever changing conditions that we experience on a daily basis."



Aeration basin #1



Perry WWTP view before dewatering project.



Control panel for each clarifier pump station.

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